

#### 4. PRODUCTION, IMPORT, USE, AND DISPOSAL

##### 4.1 PRODUCTION

The element tin comprises 0.0006% of the earth's crust (WHO 1980; Windholz 1983). Among the nine minerals containing tin are cassiterite (stannic oxide), stannate, and tealite (HSDB 1989). Of these, only cassiterite has commercial significance (WHO 1980). After tin-containing ores are mined, they undergo concentrating by either a gravity or magnetic separation process prior to smelting (HSDB 1989): Appreciable quantities of tin are obtained by recovery from tin-containing scrap materials (HSDB 1989; U.S. Bureau of Mines 1989; WHO 1980).

United States mine production of tin has been negligible between 1984 and 1988 (U.S. Bureau of Mines 1989). Currently, there is only a single tin-smelting facility in the United States which produces tin from tin ore (U.S. Bureau of Mines 1989). This facility, located in Texas City, Texas, produced approximately 3,500 metric tons of tin in 1988 from tin ore concentrates (domestic and imported) and recovered tin (U.S. Bureau of Mines 1989).

Twenty-five percent of the tin used in the United States is recovered from scrap materials containing tin. This secondary production occurs in the eastern parts of the United States at 7 detinning plants and 162 processing plants (U.S. Bureau of Mines 1989). The U.S. Bureau of Mines (1989) estimated that the 1989 consumption of primary tin in the United States will be 39,000 metric tons, most of which will be met by imports and the domestic recovery of tin from scrap materials.

##### 4.2 IMPORT/EXPORT

Tin and tin ore quantities imported to the United States for consumption were 39,704 metric tons in 1986 (HSDB 1989), 44,103 in 1987 and estimated at 41,000 metric tons for 1988 (U.S. Bureau of Mines 1989).

No data were located regarding the import of tin compounds.

The United States export of tin ingots, pigs, and bars has varied between 1,300 and 1,550 metric tons per year between 1984 and 1988 (U.S. Bureau of Mines 1989).

No data were located regarding the export of tin compounds.

##### 4.3 USE

The principal use of tin is in the making of containers (HSDB 1989), including aerosol cans and miscellaneous food and beverage containers (WHO 1980). Tin is also used as a reducing agent in chemical processes and in the production of other compounds such as stannous chloride, stannic oxide, and in the production of organotin compounds (HSDB 1989; WHO 1980). Tin is used to coat copper wire, and as a soldering material. Alloys of tin are used to make

#### 4. PRODUCTION, IMPORT, USE, AND DISPOSAL

dental materials (silver-tin-mercury) (WHO 1980), nuclear reactor components (tin-zirconium), aircraft components (tin-titanium) (WHO 1980), bronze (copper-tin), and brass (HSDB 1989). Tin is the principal component of pewter.

Inorganic tin compounds are used in the glass industry where they are used to give added strength to glass. Inorganic tin compounds also serve as the base for the formulation of colors, as catalysts, and in perfumes and soaps (WHO 1980).

Stannic oxide (cassiterite) is used as a polishing compound for both glass and metal. It is also used to produce milky or colored glass and is used in the formulation of fingernail polish (Windholz 1983).

Organotin compounds have various industrial uses. Disubstituted organotins are used in the production of plastics including food wrap where they act as stabilizers at 0.5%-2.0% by weight (WHO 1980). Disubstituted organotins are added to polyurethane foams and silicone to increase their strength and to minimize stickiness and odors (WHO 1980).

Trisubstituted organotins are useful biocides in agriculture and industry. They function as fungicides, bactericides, antihelminthics, and rodent repellents (WHO 1980). Tributyltins are used as antifoulants in marine paints but are restricted by the Organotin Antifouling Paints Control Act (June 16, 1988) which limits the type of vessel on which these paints can be used and sets acceptable release limits (U.S. Bureau of Mines 1989). Bis(tributyltin)oxide is used as a preservative for wood products, leather, ropes, fabrics, and paper.

##### 4.4 DISPOSAL

Tin-containing wastes in the form of salts, slags, and muds are generated as a result of smelting, refining, and detinning processes (WHO 1980). Solid wastes containing tin are generated by both domestic and industrial users of containers (WHO 1980). Tin-containing wastes may be incinerated or disposed of in landfills (WHO 1980).

Tin is not listed as a hazardous waste constituent by the Environmental Protection Agency and therefore its disposal is not restricted by federal land disposal restrictions. No data were located regarding the amounts of tin disposed of by any means or trends in the disposal of tin.